

Abstracts of Technical Articles from Bell System Sources.

*A Review of Radio Communication in the Mobile Services.*¹ CLIFFORD N. ANDERSON. Developments in radio communication in the mobile services during 1935 have been largely in the nature of gradual improvement of existing equipments and services.

In the marine field, the safety-of-life aspect is assuming increased importance. Rearrangements have been made of the frequencies and the schedules of radio beacons to avoid interference thereby making the system more effective. The improvement of radio compasses, regulations regarding motor lifeboat equipment and public address alarm systems, requirements for radio auto alarms and experimentation with collision prevention equipment are other items on which progress has been made the past year. The development in marine radio-telegraphy has been chiefly along the lines of greater application of the high frequencies. Directional antennas at the shore receiving stations have mitigated the effects of interference. Facsimile transmission of weather maps and press is being tried out. Improvements have been made in radio telephone equipments of various powers and frequency ranges for various types of marine service. A system utilizing ultra-high frequencies was put into operation at Philadelphia during the year. Three commercial stations are in operation in the two-megacycle range, the one at Seattle having been opened this year.

Radio is an important factor in the operation of modern air lines. Special mention should be made of the important role played by radio in the newly established transpacific service by the Pan American Airways. Improvements have been made during the year in airway beacons and radio compasses; airport traffic control and blind landing systems are being tried out. In addition to the beacon and communication receiver, a small five-watt transmitter has been made available for the use of itinerant flyers in communicating with airports.

The use of radiotelephony with police cars is the most important application of radio with automobiles. There are two general types of this service, both of which have expanded materially during the past year. One consists of a one-way service from police headquarters to the cars and is usually conducted on a frequency in the range of 1500 to 2500 kilocycles. The other is a two-way service generally operating in the ultra-high-frequency range of 30,000 to 40,000 kilocycles.

¹ *Proc. I. R. E.*, March, 1936.

Another phase of radio with automobiles is the use of broadcast receivers in pleasure cars. Under-the-car antennas, made necessary by introduction of all metal automobile tops, inclusion of the radio control as a part of the instrument board, and the use of circuits for reducing ignition noise are the more important features of 1935 developments.

*Photons and Electrons.*² KARL K. DARROW. In a book entitled "Biological Effects of Radiation" edited by Professor B. M. Duggar of the University of Wisconsin, Dr. Darrow contributes the first chapter of 42 pages. In descriptive and brief manner the following topics are discussed: Waves and Corpuscles; Monochromatic light and measurement of wave-length; External photoelectric effect and measurement of photon energy; Units of wave-length, wave number, frequency, and photon energy; Regions of the spectrum; Absorption of light by atoms; Continua in absorption spectra, and ionization by light; Theory of absorption lines; Terms; Absorption in X-ray region; Emission of light; X-ray emission spectra; Production of X-rays; Production of light of the optical spectrum; Scattering of light without change of frequency; Scattering of light with change of frequency; Scattering of X-rays; Transmutation of electron-pairs and photons.

*Neutralizing Transformer to Protect Power Station Communication.*³ E. E. GEORGE, R. K. HONAMAN, L. L. LOCKROW, E. L. SCHWARTZ. The use of commercial telephone circuits by power companies for a wide range of communication services including not only telephone but also telemetering, remote alarms, supervisory control and pilot wire control has focused attention on the problems of protection of this type of service. Where such circuits enter power stations which are subject to rise in ground potential at times of faults, the neutralizing transformer provides a means of securing adequate protection. Circuits operated into power stations through neutralizing transformers experience no adverse effects from potential rise up to 4,000 volts r.m.s. This result is produced by causing the transformer to introduce into affected communication circuits a counter voltage to neutralize the difference in ground potential. Transformers for indoor and outdoor use have been designed. The characteristics are such that they produce substantially no adverse reaction upon the transmission over the communication circuits they protect. Trials were made in the territory of the Tennessee Electric Power Company. In five locations

² Chapter in book, "Biological Effects of Radiation," Vol. I, McGraw-Hill Book Company, Inc., 1936.

³ *Elec. Engg.*, May, 1936.

in which transformers have been installed, they have prevented interruption of the circuits not only for long periods but also for short periods lasting only for the duration of a surge.

*On the Preparation of Iron and Steel Specimens for Microscopic Investigations.*⁴ FRANCIS F. LUCAS. A given lens system has certain potential resolving powers. This potential resolving power may or may not be fully realized in practice. Even a low power objective has remarkable resolving ability and the very high aperture objectives are capable of furnishing sharp brilliant images of details measuring about two hundred atom diameters.

The author describes in this paper methods and materials for the critical preparation of iron and steel specimens. A flotation apparatus which he has developed for the preparation of abrasives is described and a typical particle size analysis of a magnesium oxide abrasive prepared by this method is given.

*Some Alloys of Copper and Iron (The Tensile, Electrical and Corrosion Properties).*⁵ EARLE E. SCHUMACHER and ALEXANDER G. SOUDEN. Bars of copper-iron alloy 0.75 and 1.0 in. in diameter and 20 in. in length were prepared with compositions ranging from 75 Cu-25 Fe to 37.5 Cu-62.5 Fe without segregation sufficient to detect by differences in electrical and mechanical properties. These alloys were hot worked satisfactorily to 0.25 in. rod. The copper-iron alloys in the range investigated consist of a mixture of solid solutions of the constituent elements, the phase relationships of which depend on the thermal treatment.

A few of the observations made concerning these alloys are listed below:

1. The alloys in the range investigated are of the precipitation hardening type, but do not require a drastic quenching treatment to retain a supersaturated iron-rich phase. The optimum combination of tensile and electrical properties is obtained in the 50 copper-50 iron alloy by aging at 500° C. followed by hard drawing.
2. High tensile strengths associated with desirable electrical conductivities can be developed for certain of the compositions. An alloy of 50 Cu-50 Fe, for example, can be prepared in the No. 18 AWG with an ultimate strength of 180,000 to 190,000 lbs. per sq. in. and an electrical conductivity of approximately 30 per cent.

⁴ *Trans. Amer. Soc. for Metals*, March, 1936.

⁵ *Metals and Alloys*, April, 1936.

3. The alloy of 50 copper-50 iron can be satisfactorily tinned commercially.
4. Within the range of alloys studied, corrosion resistance decreases with increase of iron content. Various corrosion tests indicate that these alloys might prove corrosion resistant in inland rural districts, but that they are unsuitable for use in marine atmospheres and would probably be unsatisfactory in most industrial atmospheres, particularly in regions near the sea coast.

*A Study of the Electromagnetic Field in the Vicinity of a Radiator.*⁶ F. R. STANSEL. The complete equations for the electromagnetic field of an infinitesimal current element are given. The integration of these equations is considered for the case of a finite radiator having an empirical current distribution. Tables are included to facilitate computation and consideration is given to difference in phase of the current in various portions of the radiator.

*An Analysis of Theater and Screen Illumination Data.*⁷ S. K. WOLF. During the past twenty years much information on theater and screen illumination has been accumulated. The significance and reliability of these data are discussed in the light of known physical factors influencing proper illumination. As a first approximation to a standard, it is suggested that the data indicate a value of 8 to 12-foot candles as representing satisfactory illumination. Variation of required illumination with screen size is analyzed, and a solution of the problem is suggested. The brightness of screen surroundings also is discussed. It is concluded that improvement in projection may be made by stricter application of existing information but that further investigations are desirable.

⁶ *Proc. I. R. E.*, May, 1936.

⁷ *Jour. S. M. P. E.*, May, 1936.